

sky; the average excess for January, 1896, is 4.4 per cent for photographic records, and 4.5 per cent for thermometric records. The details are shown in the following table in which the stations are arranged according to the greatest possible duration of sunshine, and not according to the *observed* duration as heretofore.

Difference between instrumental and personal observations of sunshine.

Photographic stations.	Possible duration.	Instrumental.	Personal.	Difference.	Thermometric stations.	Possible duration.	Instrumental.	Personal.	Difference.
	Hrs.	%	%	%		Hrs.	%	%	%
Galveston, Tex.	326.8	45	44	1	New Orleans, La.	324.6	42	41	1
Savannah, Ga.	320.5	51	39	12	Vicksburg, Miss.	330.5	34	32	2
San Diego, Cal.	318.5	62	56	6	Atlanta, Ga.	316.2	48	44	4
Santa Fe, N. Mex.	311.8	77	63	14	Wilmington, N. C.	316.2	53	52	1
Dodge City, Kans.	306.5	55	47	8	Little Rock, Ark.	314.7	40	35	5
Kansas City, Mo.	303.7	34	37	-3	Louisville, Ky.	306.5	31	24	7
Washington, D. C.	303.8	46	46	0	San Francisco, Cal.	306.5	37	35	2
Eureka, Cal.	298.4	25	26	-1	Baltimore, Md.	303.8	40	37	3
Salt Lake City, Utah.	298.4	40	25	15	Cincinnati, Ohio.	303.8	34	34	0
Cleveland, Ohio.	295.5	20	23	-3	St. Louis, Mo.	303.8	48	41	7
Eastport, Me.	286.8	54	43	11	Columbus, Ohio.	301.1	25	20	5
Portland, Ore. *	288.1	22	31	-9	Philadelphia, Pa.	301.1	57	45	12
Bismarck, N. Dak.	279.8	30	35	-5	New York, N. Y.	298.3	48	45	3
Helena, Mont.	279.8	41	44	-3	Boston, Mass.	295.5	52	48	4
Phoenix, Ariz.	318.3	77	72	5	Chicago, Ill.	295.5	35	30	5
Denver, Colo.	301.1	80	57	23	Des Moines, Iowa.	295.5	49	38	11
					Detroit, Mich.	295.5	34	27	7
					Buffalo, N. Y.	292.7	21	13	8
					Rochester, N. Y.	292.7	49	26	23
					Portland, Me.	289.7	62	45	17
					Portland, Ore. *	283.1	26	31	-5

* Records kept by both methods.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

The dates on which reports of thunderstorms for the whole country were most numerous were: 21st, 33; 22d, 35d; 23d, 45; 31st, 27.

Thunderstorm reports were most numerous in Texas, 44; Florida, 33; California, 30; Louisiana, 28; Alabama, 19; Georgia, 16; Mississippi, 15.

Thunderstorms were most frequent in: Texas, 11 days; California, 8; Louisiana, 7; Florida and Mississippi, 5.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 1st to the 4th, and also the 25th to the 31st, inclusive. On the remaining twenty days of this month 102 reports were received, or an average of about 5 per day. The dates on which the number of reports especially exceeded this average were: 3d, 71; 4th, 23; 5th, 21.

Auroras were reported by a large percentage of observers in: Maine, 126; New Hampshire, 77; North Dakota, 55; Minnesota, 27; Wisconsin, 26; New York, 20.

Auroras were reported most frequently in: North Dakota, 11 days; Montana, 10; Minnesota and Wisconsin, 9; Maine, New Hampshire, and New York, 8.

CANADIAN REPORTS.

No thunderstorms were reported.

Auroras were reported as follows: 2d, Charlottetown, Winnipeg; 3d, Quebec, Montreal, Rockcliffe, Toronto, White River, Minnedosa, Prince Albert; 4th, Rockcliffe, Toronto, White River, Port Arthur, Winnipeg, Prince Albert; 5th, St. Andrews, Toronto, White River; 6th, Father Point, Quebec, Minnedosa; 8th, Minnedosa, Medicine Hat; 9th, Montreal; 10th, Medicine Hat; 11th, Battleford; 13th, Minnedosa; 14th, Father Point, Minnedosa, Medicine Hat, Prince Albert; 15th, Father

Point, Port Arthur; 16th, Port Arthur, Minnedosa, Edmonton; 17th, St. Andrews, Minnedosa; 18th, Father Point, Minnedosa, Battleford; 19th, Quebec, Minnedosa, Edmonton; 20th, Minnedosa; 21st, Father Point, Medicine Hat; 26th, Prince Albert; 29th, Medicine Hat; 31st, Yarmouth.

INLAND NAVIGATION.

The *extreme* and *average* stages of water in the rivers during the current month are given in Table VIII, from which it appears that the only river that rose above the danger line was the Sacramento, at Red Bluff, on the 29th.

ICE IN RIVERS AND HARBORS.

The charts of depth of snow on the ground and thickness of ice published weekly by the Weather Bureau show that by Monday, January 6, much ice had formed on the Great Lakes, the upper Mississippi and Missouri rivers; there was a general increase in thickness throughout the month and on Monday, January 27, the thickness in inches was about as follows:

Missouri River.—Miles City, 16; Williston, 25.5; Bismarck, 30; Pierre, 19; Yankton, 18.5; Sioux City, 15; Omaha, 10; Kansas City, 2.0.

Red River of the North.—Moorhead, 30.

Upper Mississippi.—St. Paul, 17; La Crosse, 15; Dubuque, 10.5; Davenport, 9; Keokuk and Hannibal, 0.

Hudson River.—Albany, 11.

Lake Superior.—Duluth, 21.5; Sault Ste. Marie, 7.

Lake Michigan.—Green Bay, 13; Milwaukee, 6; Chicago and Grand Haven, 0.

Lake Huron.—Alpena, 9.5; Port Huron, 6.0.

St. Clair River.—Detroit, 12.

Lake Erie.—Toledo, 4; Sandusky, 4; Cleveland, 4; Erie, 7.5; Buffalo, 4.

Lake Ontario.—Oswego and Rochester, 4.

METEOROLOGY AND MAGNETISM.

By PROF. FRANK H. BIGELOW.

It has been found expedient to make a further modification in the presentation of the meteorological and magnetic data, showing the approximate synchronisms in the two types of elements, beginning with January, 1896. This is in part due to the action of the vertical-force magnetometers at Washington and Toronto, which are both affected by magnetic waves from the neighboring trolley-line systems, and also, in part, to the improved operation of the new "magnet-watch," used as an integrator of work in the varying terrestrial magnetic field. The encroachment of trolleys into the neighborhood of our permanent magnetic observatories causes great injury in this branch of science. There seems to be no way to compensate this action without shutting off too much of the terrestrial field by excessive damping, and in that case the variations are greatly obscured. Fortunately the horizontal components, from the bifilar and the declinometer, are much less disturbed, inasmuch as the magnetic lines induced by the trolleys enter the earth along the normal, or very nearly so. The synchronism of the horizontal components at Washington and Toronto continues to be valuable; but in the vertical component the amplitudes derived from the data show very different sensitiveness, and the sequence of crests is also very irregular at times. This misfortune, falling upon our observatories, is to be deplored, but it can not be avoided, unless by removal of the instruments to locations far from all electric lines. In San Antonio, Tex., the same difficulty was encountered 3 miles from the trolley line, and it was found that such disturbances could be detected for a distance of 20 miles. Accordingly our computation has been modified by omitting ΔV , dz , s , and α , all of which depend upon the vertical force.